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Issued September 30, 1910.

U. S. DEPARTMENT OF AGRICULTURE.

FARMERS' BULLETIN 409.

SCHOOL LESSONS ON CORN.

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WASHINGTON:

GOVERNMENT PRINTING OFFICE.

1910.

LETTER OF TRANSMITTAL.

U. S. DEPARTMENT OF AGRICULTURE,
OFFICE OF EXPERIMENT STATIONS,
Washington, D. C., May 1, 1910.

SIR: Three years ago the Department issued as Bulletin No. 186, Office of Experiment Stations, a publication entitled "Exercises in Elementary Agriculture—Plant Production." Owing to the continuous and growing demand for this bulletin, coming largely from rural-school teachers, it seemed wise to provide for its more general distribution by reissuing it in the series of Farmers' Bulletins. Accordingly, Parts 1 and 2 of Bulletin 186, dealing with the plant and its environment, were revised and published as Farmers' Bulletin No. 408, School Exercises in Plant Production. Part 3, lessons on corn, has been rewritten and combined with Circular 96 of this Office, How to Test Seed Corn in Schools, and is submitted herewith for publication as a Farmers' Bulletin on School Lessons on Corn.

Respectfully,

A. C. TRUE,
Director.

Hon. JAMES WILSON,
Secretary of Agriculture.

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ILLUSTRATIONS.

SCHOOL LESSONS ON CORN.

For a considerable number of years more attention has been given by farmers to the production and improvement of corn than to any other grain or general farm crop. It has not so generally had the attention of teachers and pupils in the schools. With the rapid spread of experimental corn growing through the work of boys' and girls' agricultural clubs the need of such study in the schools has come to be better appreciated. The design of this bulletin is to furnish suggestions for developing the real educational value of this study and establishing some of its connections with arithmetic, botany, and other school subjects.

At the outset a general acquaintance with the corn plant is desirable. Many a boy and girl—and teachers, too—have dwelt in the presence of cornfields for a considerable part of their lives without appreciating the many features of interest which the structure and functions of this plant have to offer to the inquisitive student. In order to discover some of these, the following topics and questions are suggested:

CLASS STUDIES.

1. The kinds of corn.—What kinds of corn have you seen? Get an ear of as many of the following kinds as you can: Flint, pop, sweet, and dent corn. How do they differ? Do their names properly describe them? Which is hardest? Which pops most readily? Is there any relation between the hardness and the popping? What is each kind mostly used for? How many kinds are grown in your school district? If any kind is not grown, try to find out why. Does corn require a warmer or a cooler climate than wheat? Which is more widely grown in the United States? Which produces the larger annual crop?

2. Location of color in the kernels.—Get an ear of "calico" or red corn and one of yellow corn. Remove the outer skin from kernels of each. Where is the color found in each?

3. Number of rows, kernels, etc.—Get ears of as many kinds of corn as you can. How many rows on an ear? Is the number even or odd? Do all kinds have the same number? How many kernels

are there on an ear? (Count the number of kernels in one row of each kind and multiply by the number of rows.)

4. The embryo and its food.—Have each pupil supplied with kernels of corn. What differences in the two sides of the kernel? The young plantlet or embryo lies in the long depression. It is covered by the seed coats.

Examine some kernels that have been soaked in water for a day. Notice how the depression has filled up. Cut off the small end of

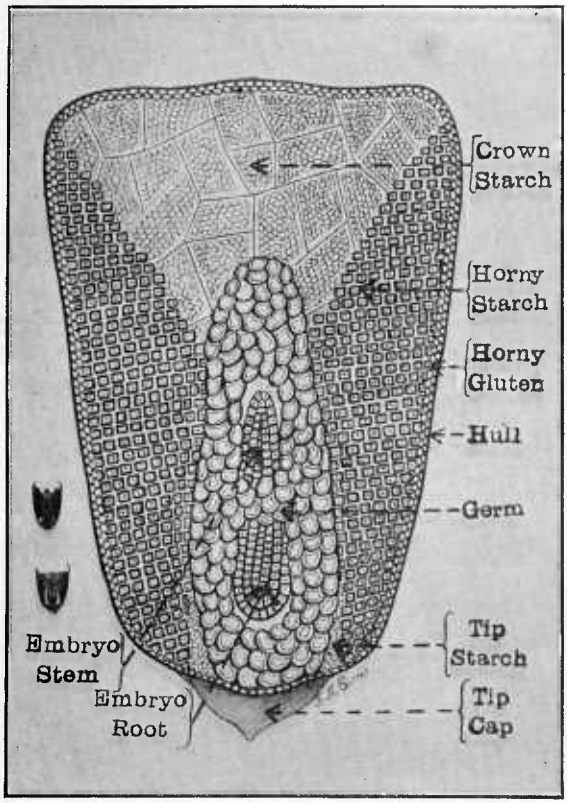

FIG. 1.—Drawing of a kernel of corn, showing its structure and composition. (From Illinois Station Bulletin 87.)

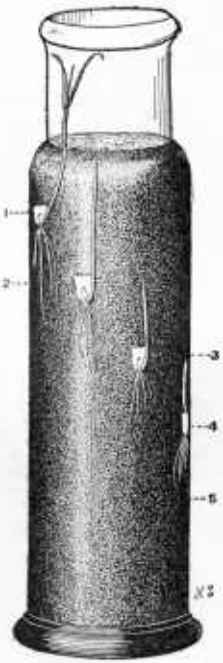

FIG. 2.—To show the best depth at which to plant corn.

the kernel. Notice the triangular part under the skin on the side where the depression was. This is the chit, germ, or embryo (see fig. 1). It is the young plant. The remainder of the kernel, except the seed coats, is called the endosperm. This contains the starch that is to feed the young corn plant. Look in the embryo for a circular part about the diameter of a pin head. This is either the leaf or root, according to how much of the kernel was cut off. Make

a drawing of the cross section of the end of the kernel and indicate the parts.

Now take another soaked kernel, place it on the table with the embryo upward, and then split the kernel lengthwise through the embryo with a sharp knife. Within the embryo find the young leaves and the root. Make a drawing of the split kernel and indicate the embryo, leaves, root, and endosperm.

Carefully remove the endosperm from several embryos of soaked kernels. From other kernels remove the embryos. Test these in damp cotton or clean sand to see which will sprout. Do those that sprout grow well? What is the starch for? What is the use of the

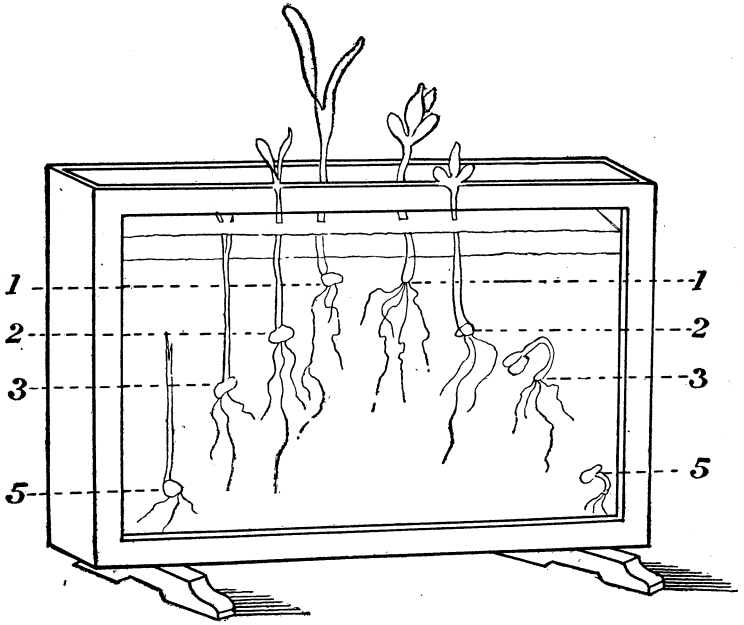

FIG. 3.—Device to determine the proper depth to plant seeds. (From Farmers' Bull. 218.)

embryo? About what proportion of the kernel is embryo? What proportion is endosperm or food?

5. Depth to plant.—Plant kernels of corn, wheat, and other seeds in a window box or in the school yard at depths of 1, 2, 3, 6, and 8 inches, and see what proportion comes up in each case. Which make the better plants? What do you conclude as to the best depth to plant each? Would this depth be the same for a sandy soil as for a clay soil? How does the proper depth vary with the size of the seed? [a]

[a] By planting corn in a tall bottle (fig. 2) or a box with glass sides, as shown in figure 3, one can find the best depth for planting and at the same time watch the progress of the young plants. Keep the bottle or box wrapped in black cloth or paper to exclude the light when not examining the plants.

Plant corn and many other seeds, such as the radish, pea, bean, beet, and squash, at home or in the school garden. Compare the ways in which they come up. Which ones bring the entire seed above ground? Which ones leave it below ground? Which ones come up arched? Which grow faster at first—those that grow from large or from small seeds? Do those that grow most rapidly at first make the largest plants?

6. When and how to plant field corn.—At what time do the best farmers in your school district plant their cornfields? What is the old Indian rule? Why do the farmers not plant earlier? Why do they wish to plant corn as early as it is safe?

Do most of them plant in continuous drills, or in hills? How far are the rows spaced apart? How far apart are the hills in each row? What is a "check rower?" How many kernels are planted in a hill? How many kernels are needed to plant an acre of ground? How many ears does that require? How many farmers in your district take their seed ears from the corncrib in the spring? Is there any certain way to find whether they will grow before planting them in the field? (See pp. 14—20.) How many kernels in a quart of good shelled seed corn? How many quarts are needed to plant an acre? How many bushels for 40 acres? How many bushels of shelled corn do the best farmers in your district raise on an acre? How does this compare with the best yields made by the boys' and girls' corn clubs in your State?

7. The culture of corn.—Is it good for the land to grow corn on the same field year after year? Why not? What is meant by "crop rotation?" What is a three-year rotation? A four-year rotation? What is the rotation generally followed for growing corn in your district? Is it satisfactory?

Directions for the proper cultivation of corn are given in Farmers' Bulletins 199 and 229 for the "corn belt States," and in Farmers' Bulletin 81 for States farther south. An outline plan for cultivating and recording growth and yields in boys' corn club contests is found in Farmers' Bulletin 385. Nearly every State also has one or more bulletins on this subject. These should always be procured from the director of the state experiment station and studied in the class.

The United States Department of Agriculture supplies special help and instruction to corn-club members in the Southern States under the direction of the "Boys' Demonstration Work." The "Williamson method" of corn culture, used to some extent in the Southern States, is described in Farmers' Bulletin 281, pages 13 to 16. (Another reference to this bulletin is made on page 12.) A general description of "Experiment Station Work in Corn Culture" has been

published as a reprint from the Annual Report of the Office of Experiment Stations for 1904.

8. A study of growing corn.—Go with the class into a near-by field of corn and make some observations. Are the rows of corn quite straight? Is it *true* that "more corn *grows* in crooked rows?" Count 100 hills in several rows. How many hills have only one stalk? Two? Three or more? None? What percentage of a perfect "stand" is there in the field, taking three stalks to the hill as a base? Why is it not higher? What percentage of a farmer's time is lost in plowing, harrowing, planting, cultivating, cutting, and husking such a field? What percentage of his horses' time is lost? What percent-

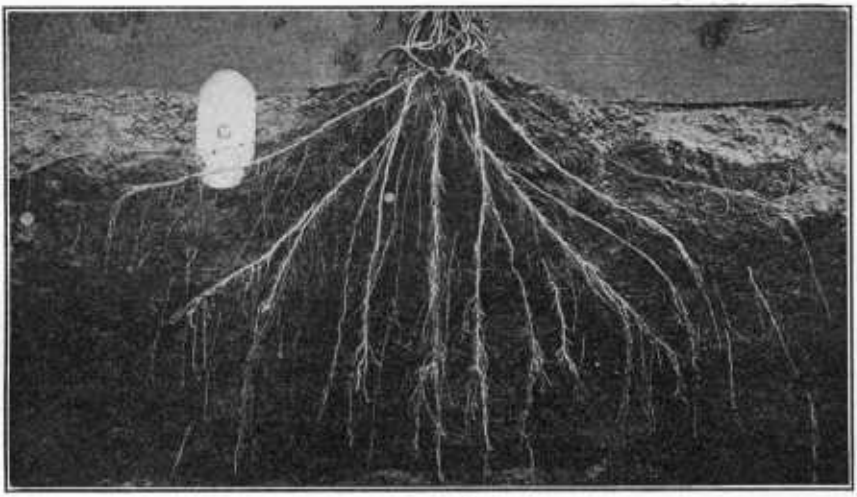

FIG. 4.—Distribution of corn roots, showing how late deep cultivation affects the roots.

age of the time of his women folk is lost in cooking for the farmer while he works in this field?

9. Corn roots.—Dig down around a hill of corn and see how near the surface the roots grow. How far do they extend from the stalk? How deep could the cultivator go without hurting these roots? (Fig. 4.) Should manure and fertilizers be placed in a narrow furrow under the corn row or should they be distributed all through the upper 6 inches of soil? About the time that the corn tassels come out the "brace roots" appear. Find some of these roots. What is their use?

10. The corn leaves and stalks.—How are the leaves arranged on the stalks? What is the position of the ears with respect to the leaves? Notice that the margin of the leaf is longer than the middle of the leaf. This makes the leaf wavy. Would this help to prevent the wind from tearing the leaves? Does the wind damage corn leaves

much in your country? What do the corn leaves do in very dry weather? Is this an advantage to the corn plant? How? Make a cross section of a corn leaf and find the location of the "bulliform cells." (Consult a text-book of botany.) What are they for? Cut across a cornstalk. Notice the threads that run through it. Where are they thickest, in the middle or near the outside of the stalk? These threads are woody bundles called fibro-vascular bundles. Split a stalk and see if they go the whole length of it. Do they extend into the leaf? Cut out about 3 inches of a stalk between joints. Put one end of this in water and blow through it. Through what part of the stalk does the air go? The chief function of the fibro-vascular bundles is to conduct the sap up and the digested food down in the plant. They extend into the leaves and become the veins, and thus help to make up the leaf framework.

The joints of the cornstalk are called "nodes" and the spaces between them are called "internodes." If a stalk of corn is broken down, at what point does it begin to straighten up again? Is the node then of the same length all around? Which side of the internodes is flattened or channeled? Is it the same side all the way up? What other crop plants have nodes and internodes like corn? Is corn a grass plant? Is wheat? Flax? Clover?

11. Corn flowers.—Does the corn have flowers like wheat?

Where are the stamens in corn? Where are the pistils? What is the yellow powder that one sees on the ground just as the silks begin to show? Why so much of it? Why is dry weather particularly bad for corn at this time? When a cornstalk grows in a place by itself what kind of an ear does it have? Why is this? Open an ear of corn that has just "silked out." Follow the threads of silk. Where are they attached to the kernels?

(The corn stamens are borne in the tassel. The silks and the kernels to which they are attached are the pistils. The pollen must fall or be blown from the tassel to the silk in order to fertilize the kernel and make it develop. There must be a great abundance of pollen, because so much is lost. Each silk extends to one kernel only.)

12. Corn ears.—On which side of the internode is the ear always found? Is a leaf sheath always found on the other side of the ear? Suppose the ear were borne on the end of a long branch with leaves arranged just as they are on the stalk. Now, if you could "telescope" this branch from tip to base so that it would be only an inch long, would the leaves then have the place of husks around the ear? Are the husks corn leaves? What is the short branch that bears the ear called? How does it come to be so short? Could it hold a large ear up off the ground if it were very long? Is it better to have the shank

hold the ear upright or allow the tip to hang down a little? Why? What is the advantage in having the tassel at the top of the stalk? Which would be the better kind of corn to cultivate—the sort we have now or one with long stalks and branches, and with both stamens and pistils at the ends? Did our present type of corn plant *result* from cultivation? Do we sometimes still find a few kernels in the tassels, or parts of the tassel attached to the ear? (Have such specimens collected at husking time and brought to the school.) Are they the best kind of corn to plant? (Try it and see.)

13. Corn pests.—Find out from the farmers in the district whether corn has any serious pests, such as birds, insects, or diseases. If the farmers are troubled with any of these, get from the publications of this Department and the state experiment station and from text-books all the information you can on the particular pests. Also, if possible, get specimens of any troublesome insect or fungus pests. Study the whole subject and have at least one recitation on it.

Below are some of the publications of this Department concerning pests of corn: Farmers' Bulletins, No. 54 (pages 18–23, The blue jay and the crow, and 29, 30, The crow blackbird), No. 28 (pages 24–30, Table of 100 weeds; study those affecting hoed crops), No. 69 (pages 18–20, Corn smut), and No. 259 (pages 20, 21, Cultural methods of controlling corn billbugs and the corn root-louse). Circulars of the Bureau of Entomology, No. 16 (3 pages, The larger cornstalk borer), No. 59 (8 pages, The corn root-worms), and No. 78 (6 pages, The slender seed-corn ground beetle).

14. Gathering and storing seed corn.—Have the pupils study and recite on Farmers' Bulletin 229, pages 21, 22, and 23. Compare the methods outlined in the bulletin with those in practice in the vicinity of the school. What advantages for the various methods are apparent?

15. The feeding value of corn.—Is most of the corn in your State fed or shipped? Which is cheaper, to ship the corn or to ship an animal that was fed on it? About how many bushels of corn are required to feed a 250-pound hog? How much would it cost to ship the corn to the nearest large stock market—Chicago, Omaha, Kansas City, Buffalo? To ship the hog?

When you sell $10 worth of corn from the farm you sell $3.78 worth of fertilizer; when you sell $10 worth of cattle you sell $1.18 worth of fertilizer. Which would be more profitable, to sell corn or to feed it to cattle and sell the cattle? Which method of farming would keep the land in good condition longer?

In addition to its value as feed for stock, corn supplies food for more people than any other cereal except, perhaps, rice. In what ways is it used as a food? What products are manufactured from

corn? What ones have you seen? What samples of them do you have in your school museum?

Have the pupils study and recite on Farmers' Bulletins 56, pages 4 and 7–9; 65, page 6; 97, pages 9–12; 122, pages 26, 27. All these deal with some phase of feeding corn to farm animals. The girls in the class will be interested in studying the value of corn as a food for human beings. This is treated in Farmers' Bulletins, 249, 281, pages 18–22, and 298.

16. Importance of the corn crop.—The corn crop of the United States during the last five years has been more than 2,500,000,000 bushels a year. How much is that per capita, i. e., for each person in the United States? This crop is worth about twice as much as any other crop. During the five years from 1903 to 1907 the average corn crop of the world was 3,360,485,200 bushels. That grown in North America averaged 2,693,237,000 bushels. What percentage of the total world crop did North America grow? Why is such a large part of the world's corn crop grown here? Is it due to the soil? To the climate? What part of the United States is the best corn region? What States are included in it? Why is this the best region?

How much corn was grown in your State last year? What is the relative rank of your State in total corn production? In yield per acre? (See Statistics of Agricultural Products in the Yearbook of the U. S. Department of Agriculture. If your school does not have the latest copy, apply for one to your Member of Congress.)

17. History of corn.—What is meant by "corn" in the Bible? Of what country is corn a native? What other important plants are native to the Western Hemisphere? Look up the common crops—wheat, cotton, potatoes, tomatoes, timothy, clover, and others, in the dictionary or cyclopedia to see of what country they are native. What people first grew corn in this country? What part did corn play in the early history of New England? Of the Middle West? (Consult encyclopedias, text-books of history, and one or more of the books listed on page 27.)

CLASS EXERCISES.

In addition to the foregoing questions and suggestions, a number of more formal class exercises in the study and handling of corn are offered in the following paragraphs.

EXERCISE 1.—SELECTION OF SEED CORN.

Have five or more pupils bring 10 ears each of the best corn they can find at home. It would be better if all could bring the same kind of corn. Before pupils attempt to select the most desirable ears for

seed have them read pages 8 and 9 of Farmers' Bulletin 229 or one of their state experiment station bulletins on corn selection or judging. Then have the pupils select 20 or 30 of the best-looking ears for use in the next exercise.

EXERCISE 2.—JUDGING CORN.

Number all of the ears from 1 to 20, or 1 to 30, as the case may be, by tying to each a small numbered tag or sticking a numbered peg into the butt of each cob. Have each pupil provide himself with a score card ruled as shown below, providing one column for each ear of corn. The figures in the score card just to the left of the first perpendicular line show the number of "points" that should be given for a perfect ear; e. g., if the pupil thinks ear No. 4 is nearly perfect in shape he would probably mark 9 in line 2, column 4, as shown in the table. Each pupil should examine carefully each ear of corn and put down on his score card in the column of the same number as the ear of corn his estimate of the qualities named on each line at the left, except line 4—vitality—which should not be filled in until after the seed is tested by the method explained on pages 14 to 20.

Then compute the germinating value of the different samples on the basis of 20 for a perfect ear, as shown in the score card, and give each ear its proper rating in line 4 of the score card. Now add up the different columns of figures in the score card, and by means of the totals select the best five ears.

Score card for corn.

Points.		1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
1. Trueness to type	10										
2. Shape of ear	10				9						
3. Purity of color in grain and cob	5										
4. Vitality, maturity, germinating power	20										
5. Tips of ears	5										
6. Butts of ears	5										
7. Uniformity of kernels	5										
8. Shape of kernels	5										
9. Length of ear	5										
10. Circumference of ear	5										
11. Furrows between rows	5										
12. Space between kernels at cob	10										
13. Proportion of corn to cob	10										
Total	100										

In order to understand the meaning of all the points listed in this score card, it is well to write to your state agricultural college or experiment station, or to the state corn breeders' association, if there is one, for an explanation of the official score card used in your State. Or it may be possible to get some one from the agricultural college or other agricultural school to come to your school or county teachers' meeting and explain the score card fully.

EXERCISE 3.—HOW TO TEST SEED CORN IN SCHOOL.[a]

There are at least three reasons why teachers, especially in the rural districts, should be interested in seed-corn testing as a school exercise: (1) It furnishes an easy and interesting study in seed germination and plant growth; (2) the extended use of a good method has vast economic value in improving the productiveness of American agriculture, and (3) the teaching of it in the rural school exerts a strong influence toward increasing the confidence of parents in the permanent worth of good school work. The teacher whose work is supported by such a sentiment in the community has her powers of usefulness increased many-fold in comparison with one who is indifferent to the home interests of her pupils and their parents. The teacher who once begins intelligently to try some simple exercises in agricultural nature study will not be long left in doubt as to the responsive interest which she can awaken in any kind of *productive* school work. Children love to *do* things—especially things that are obviously useful; they need only judicious direction in order to turn this instinct into various forms of continuous self-education—which is the only kind that "sticks."

It has come to be true that almost every farmer and rural schoolboy now understands the importance of testing seed corn before planting—and testing it *in the ear* rather than after shelling. But many farmers fail to *do* as well as they *know* in this matter, because they regard many of the methods that have been recommended for testing seed corn as "too much trouble." The plan that is here described is simple enough to be easily followed by any boy or girl in the public schools,[b] and it costs very little.

The only materials needed are a shallow wooden tray, a small handful of carpet tacks, a few yards of wrapping twine, sand enough to fill the tray, and three or four quarts of water. The tray (or several of them) can easily be sawed from an empty soap or cracker box. When finished, it should be about 1½ inches deep inside, 15 inches wide, and 23 inches long; but any of these dimensions may be varied slightly. This tray is divided into small squares by a checkerboard lacing of twine across the top. It is convenient to have these squares about 1½ inches on a side, ten of them in a row across the narrow way of the tray and fifteen the other way.

Figure 5 shows the general appearance of such a tray and the method of lacing the twine back and forth across the tray and under

[a] This exercise is a reprint of Circular 96, prepared in the Agricultural Education Service of the Office of Experiment Stations, by F. W. Howe. It is believed that the importance of testing seed corn justifies the extent of space devoted to this topic.

[b] So far as can be learned, the essentials of this plan were first developed by Prof. J. A. Jeffery, of the Michigan Agricultural College.

the tacks. This lacing with the string should not be done until the tray has been loosely filled with dry sand, heaped up a little above its top edge. Then the sand should be scraped off with a yardstick, or other straightedge, even with the top of the tray. After lacing with the string, the tray is then ready for planting.

Have the children arrange the ears to be tested in rows of ten, to correspond with the rows of squares across the tray. These rows of ears should be kept in a dry, warm place on the floor, on corn racks, or on shelves, where it can be certain that they will not be disturbed or displaced until the test is finished. A nail is sometimes driven into the shelf or floor at each end of a row of ten ears to keep them in place.

When ready to begin the test, two children can work to the best advantage, one to handle the individual ears and the other to plant the tray. The first takes up ear No. 1 in the first row, and, with the

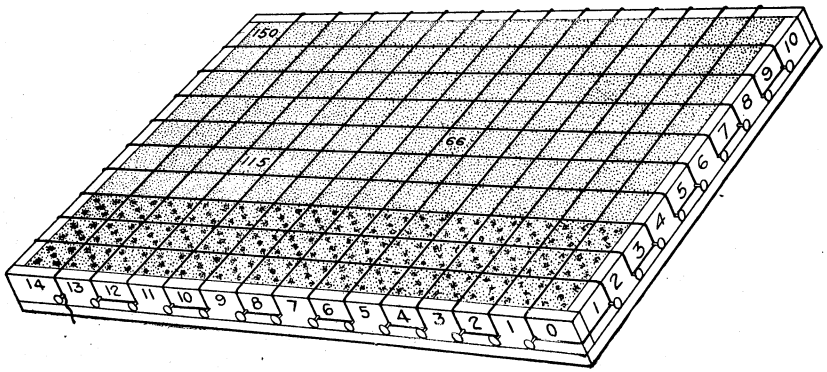

FIG. 5.—A sand tray for testing seed corn.

point of a pocketknife applied to the *edge* of a kernel, removes five kernels from each ear, passes them to the second pupil, and carefully replaces the ear in its row. The kernels should be taken in succession (taking only those of average size) from about an inch above the base of the ear to the same distance below its tip, passing spirally *around* and *lengthwise* of the ear. This insures a fair test of the whole ear, as it sometimes happens that one side or one end of an ear is sound, while the other will not grow. Figure 6 shows a few ears with kernels removed in this spiral fashion.

The second pupil plants each five kernels in the square which corresponds with the ear from which they were taken. Each of the first four kernels is set in one corner of the square, point downward, and pushed down just far enough to be covered by the dry sand when the forefinger is withdrawn. The fifth kernel is planted in the center of the square, and all should have a uniform depth below the surface

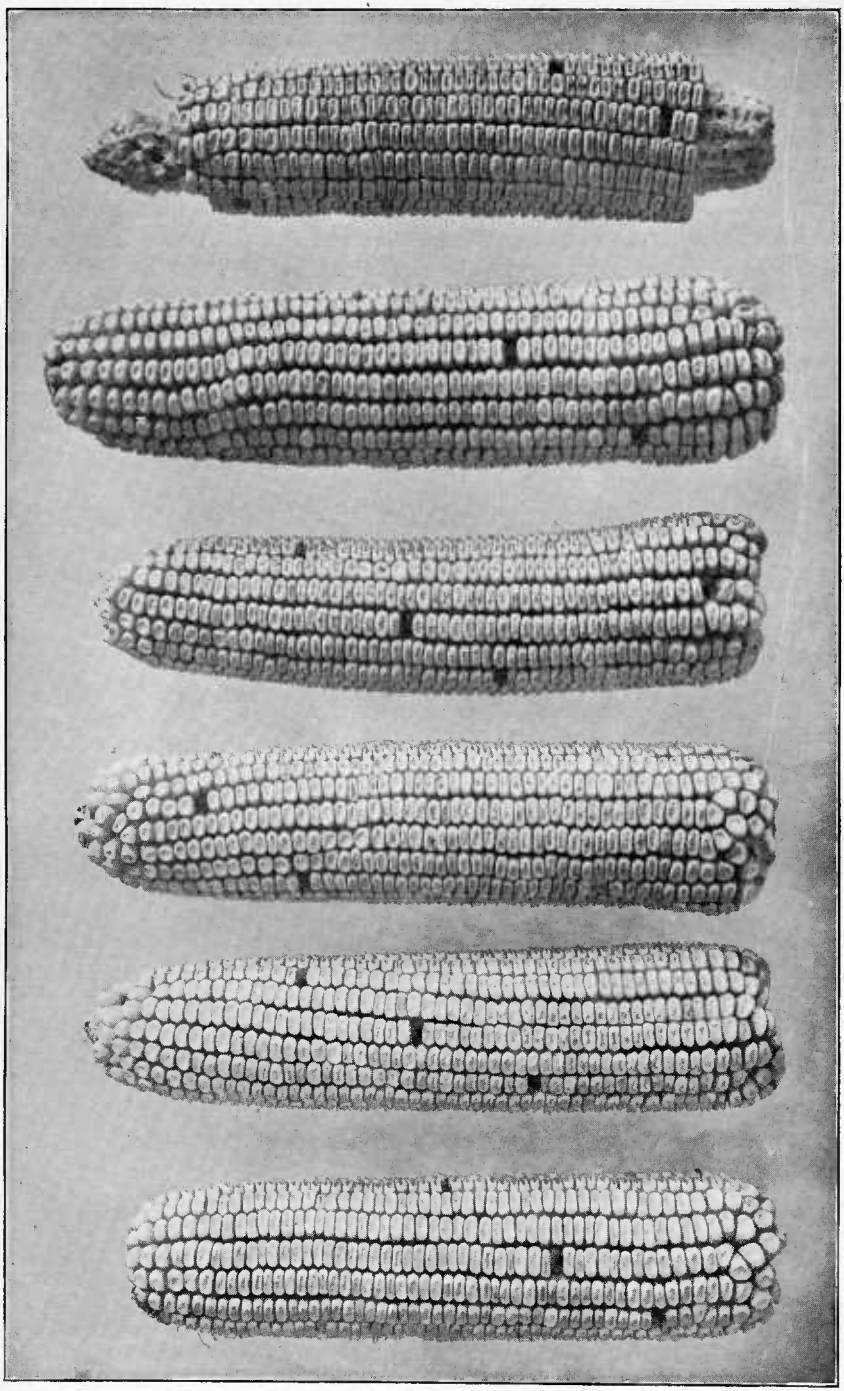

FIG. 6.—Ears of seed corn with kernels removed for testing.

of the sand. Figure 5 shows the first three squares planted in each of the fifteen rows.

Two pupils working together can plant at least one square a minute, and much faster with a little practice. But it is important to do the work carefully and treat *all* the kernels *alike*, so that the test may be scientifically exact. This is why dry sand, or some other earth of *uniform* quality and free from foreign substances, is recommended for filling the tray. The same sand should not be used twice unless baked and carefully sifted before the second planting.

When a tray has been planted it must be thoroughly watered and kept in a warm room (perhaps on the warming oven of the kitchen range at home or on a shelf above the schoolroom stove), where it will not be upset or disturbed until the test is finished. The watering is best done by laying a small piece of paper flat on the tray and pouring the water carefully on this until the sand is fully saturated.

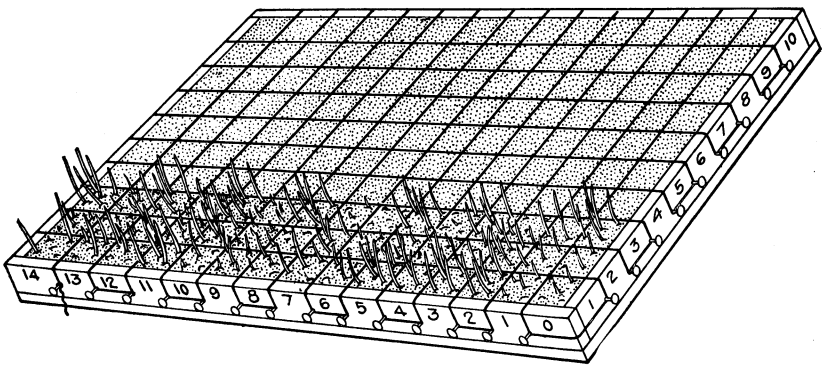

FIG. 7.—Sand tray showing corn seven days after planting.

(There is a *reason* for using the paper.) The planted tray should not be allowed to dry out until the young corn plants are an inch or two above the sand. Sometimes the corn roots are stiff enough to push the kernels up out of the sand. When this happens they should be covered again by sprinkling some damp sand on them.

This method of germinating seed corn has been carefully tested for a long term of years. It is one of the best plans to use in schools because the necessary materials can be easily procured, the germinating seed does not need to be uncovered or disturbed during the test, and the conditions are artificial only to the extent of treating all kernels alike, which is necessary to secure reliable results. Testing in soil is much the most natural method of determining the probabilities of growth in the field.

Figures 7 and 8 show the progressive growth of corn plants in the tray at the end of successive periods. It is best to make the final

examination of the plants at some point between the stages shown in these two views, as the latter is a little too far advanced to permit doing the work easily. The plants should be about 2 or 3 inches high. Begin at square No. 1 and carefully examine each square in regular order through to the last. If you find five good, sturdy plants growing from the five kernels planted in a square, the ear from which they came is all right for planting in the field. It is not necessary to pull these plants up or to examine the roots; you can be sure that the roots are all right if the plants are satisfactory.

If there are five plants in the square, but two or more of them are shorter than most of the others in the tray, or look pale and sickly, take at once the ear from which they came out of its row and do not let it get mixed with those that are to be shelled for planting in the field.

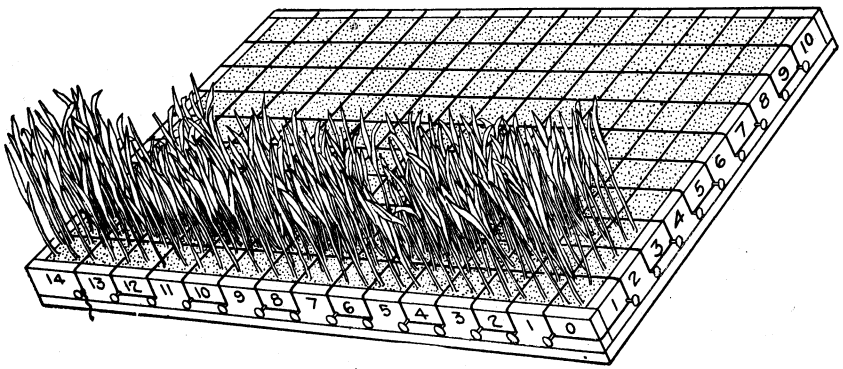

FIG. 8.—Sand tray showing corn twelve days after planting.

If there are four good plants in the square, but the fifth one is smaller or can not be seen at all, dig down carefully until you find whether the kernel germinated. Sometimes the plumule (young stalk) is held at the tip by the tough skin or hull of the kernel until it is bent over and starts to grow horizontally or downward under the sand. Such a stalk may not yet have its head out in the air when the tray is examined, and so may be pale and weak from lack of breath and sunlight. That would not show any positive fault in the ear from which it came and would not be a sufficient cause for discarding the ear.

If one kernel out of the five has not begun to grow at all, while the rest from the same ear are an inch or two above the sand, it will not be safe to plant that ear. Do not save any ear for seed after the test unless you feel sure that every kernel planted in the field is likely to grow. Every poor ear planted spoils about one-fifteenth part of an acre in the cornfield—and yet some farmers would "blame it on" the

crows, or the weather, or something else which they *could not* help; but they *could* be sure of planting seed that they *know* has shown itself able to grow. Occasionally some farmers still make the mistake of first shelling all their seed corn (or buying shelled corn for seed) and then testing a hundred kernels of it. If there is one bad ear in the lot that was shelled, its kernels are then mixed with all the rest, and there is no way to discover or remove them. The *ear* holds them all together until it can be determined whether they will grow.

Until the test is finished, it is *very important* to keep the ears in place, so that the one corresponding to any square in the tray can be picked out at once. If the ears are not laid in rows of ten, they must be numbered in some other way. The number of any square is easily known by referring to the way the tray is numbered in figure 1. Thus square 66 is the *sixth* square in the *row* numbered 6; and the number of any square in the tray is determined by this simple rule: Consider the number marked at the left end of any row as *tens*, and add to this the *unit* number representing the given square (shown in fig. 1 at the right-hand end of the tray). Note whether squares 115 and 150 are correctly numbered according to this rule. If the corresponding ears are arranged in fifteen rows (calling the first row *zero*), the number of any ear can be found in the same way. If this plan is not followed, each ear should be tagged and numbered in consecutive order. Fifteen ears of good size will plant an acre of corn, three kernels to the hill.

(How many kernels must there be on each ear?)

Good care must be taken of the seed corn *after* it is tested, and the testing would better not be done more than two or three weeks before planting in the field. Through lack of care a lot of good seed corn can be spoiled in three weeks—or even three days—by wetting and molding or by freezing. Before shelling the tested ears it is considered best to remove the small or irregular kernels for upward of an inch from each end of the ear (note the last ear in fig. 6), as these kernels do not usually germinate and grow at the same rate as those in the middle of the ear, and their irregular size also prevents uniform dropping in the planter. All the remaining kernels on the tested ears can then be shelled together, and it is best to mix them thoroughly afterwards, unless you wish to select a few of the best unshelled ears to start a "breeding plat," such as that outlined on page 26.

The corn-testing method here described can be easily carried out in the ordinary schoolroom if the temperature is not allowed to go below 50° F. If there should be any danger of freezing, the planted tray can be taken to a near-by pupil's home, kept there until the plants are large enough for final examination, and then brought back to the

school carefully covered with a blanket that will not crush the young stalks. It is well to have at least one tray tested by the school so that all the children can see and understand the entire process. Then as many as can should be encouraged to test at home the corn which their fathers expect to plant. Where this can not be done at home, some schools have offered to do the testing for farmers; but this requires that the ears to be tested shall be carefully numbered, or arranged in rows of ten, and that five kernels from each shall be brought to the school in little envelopes or packets numbered to correspond with the ears. When the test is finished, the *numbers* of the poor ears must be carefully recorded for reporting back to the farmer from whom the seed came.

It makes a good experiment for the school garden to plant some of the ears which show poorly in the school's testing tray, and see whether they will do any better under outdoor conditions. In contrast to this, some of the best ears can be planted in a school "breeding plat," as suggested in Exercise 6, page 26. The work of the school may thus become the means of greatly improving the quality and yield of corn throughout the whole district.

EXERCISE 4.—SELECTING EXHIBITION CORN.

It has become quite common to have local, county, and State corn shows, with all or a part of the exhibits offered by pupils in the public schools.

The exhibit from one person usually consists of five or ten ears of corn. Sometimes a ten-ear exhibit to represent the entire local school is made up by selecting that number of ears from the best ones brought in by all the members of the school.

One very important thing to observe in choosing and arranging all such exhibits is the principle of *uniformity*. This is sometimes indicated in score cards by the phrase "uniformity of exhibit." In the score card form shown on page 13 it is covered by "trueness to type" and "uniformity of kernels." These phrases all mean that in order to get a high rating all the ears in the set must *look alike* as nearly as possible. A corn judge often discards a set of five or ten ears from any further consideration simply because the exhibitor included among them one ear that was an inch longer than the rest, or of a different shade in color, or that had a different number of rows of kernels, or kernels of noticeably different shape or size than those on the rest of the ears. Sometimes the size of cob in one ear differs from all the others, or one ear is crooked or has "twisted" rows of kernels, while all the rest are straight.

Any of these defects spoil the *uniformity* of the set and cause the set to be marked down severely. It is better to select ten ears that

are not the very best, but are *alike*, than to include one ear that is either much better or much worse than all the rest in the set. Pick out the best 40 or 50 ears you can find, and then from these, by careful measurement and comparison, select for your exhibit the five or ten that are nearest alike.

The unfavorable impression made by a poorly selected or poorly arranged exhibit of ten ears is clearly illustrated in figures 9 and 11. Without discarding any ears from the best ten selected they can always be *arranged* in one *best* order, from left to right, so as to present whatever excellence they have in the most favorable view. (See figs. 10 and 12.) The corn judge may change this order before giving his final verdict, but in any case he will be disposed to give the exhibitor credit for knowing the advantages of a good arrangement. Furthermore, a good arrangement of the ears in an exhibit saves time for the judge, and that, too, is in the exhibitor's favor if the judging must be done rapidly.

EXERCISE 5.—CULTIVATION OF CORN.

The teacher and pupils will probably be able to arrange with some farmer near the school to carry out the following experiment, suggested by M. L. Fisher, of Purdue University:[a]

Use a part of the field most convenient to work according to the plan given below.

Two rows 3½ feet apart and 37⅓ rods long, or four rows 18⅔ rods long, will make a tenth-acre. It will probably be more convenient to use rows the full length of the field and make calculations on that basis. Have two or four rows in the plat, according to length. Have at least one extra row between plats and two rows on the outside for a border, and discard these rows in estimating the plat yields.

(1) Cultivate Plat I at least once each week (if ground is dry enough) from the time the corn is big enough until it begins to tassel.

(2) Cultivate Plat II three times during the season.

(3) Do not cultivate Plat III, but keep down the weeds throughout the season by cutting them off at the surface with a hoe.

(4) Do not cut the weeds or cultivate Plat IV at all. The space between the border row and other plats should be treated like that portion of each plat next to it.

(5) Gather the stalks and ears on all plats and weigh each separately. Divide the corn into marketable and unmarketable ears, getting the weight of each. Gather all the crop, no matter how poor. Don't guess at the results. Calculate to an acre basis and explain results.

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[a] Practical Studies in Agriculture for Public Schools.

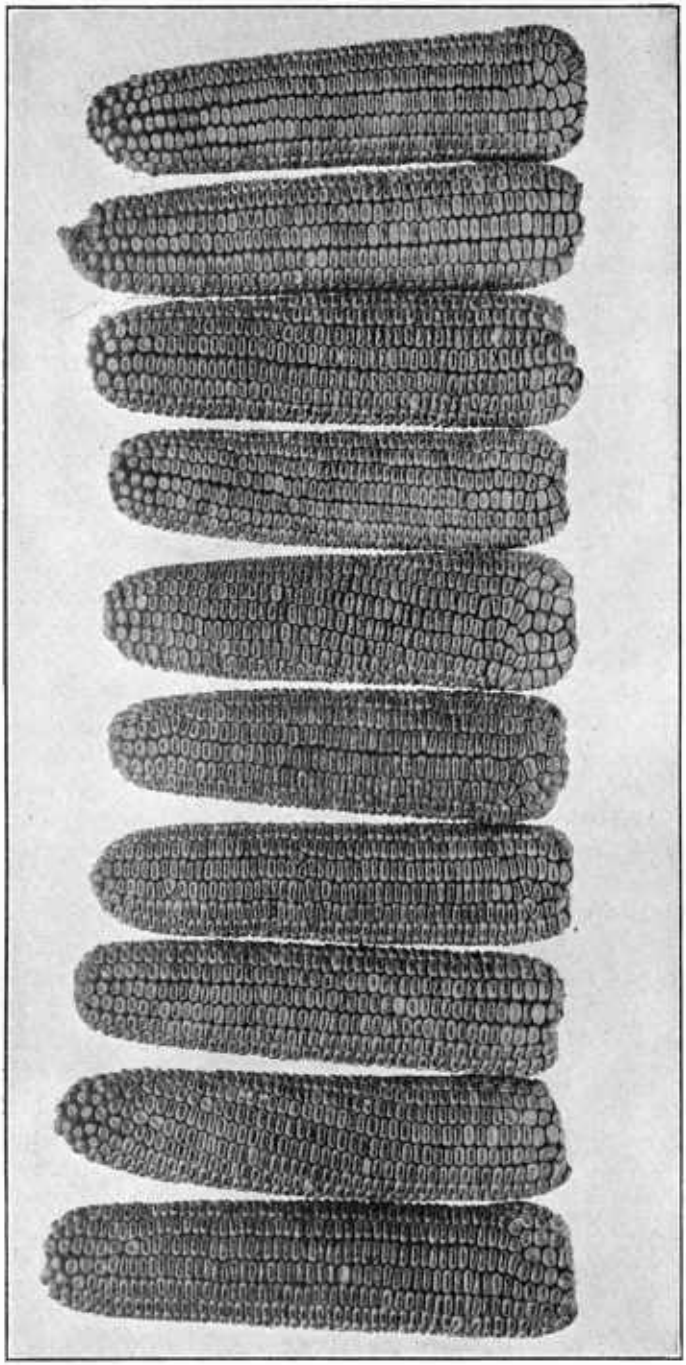

FIG. 9.—A poorly selected corn exhibit. The second ear has a pronounced "twist" in the row of kernels, and the ninth ear has a very poor tip.

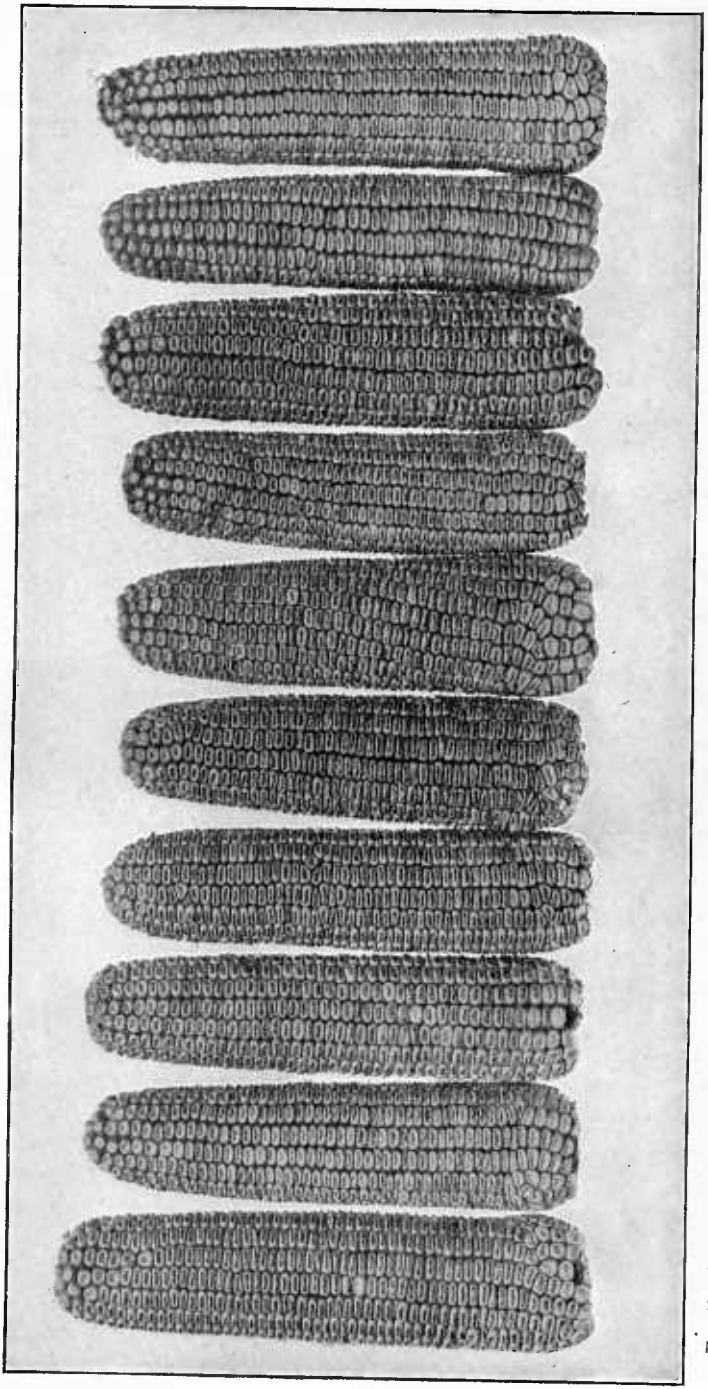

FIG. 10.—A well-selected exhibit. The substitution of two good ears for the second and ninth of figure 9 gives a satisfactory degree of uniformity to the entire set.

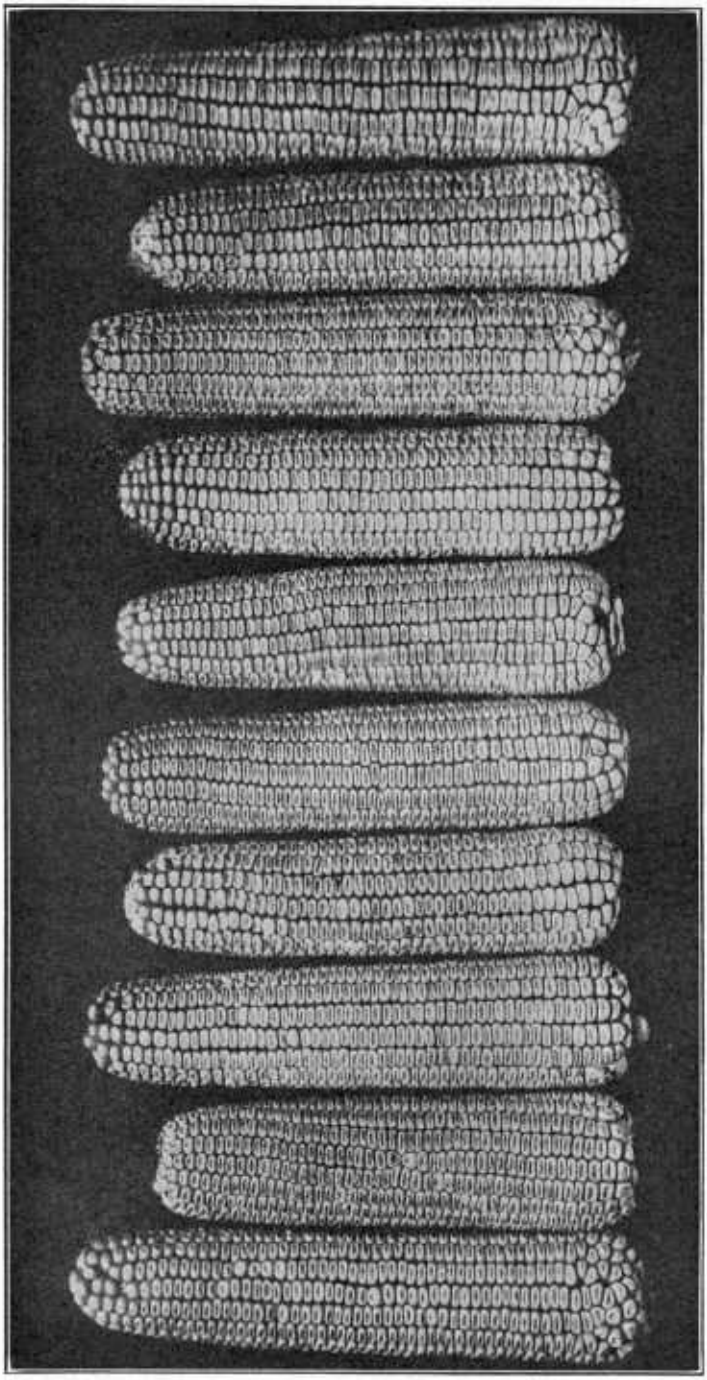

FIG. 11.—A poorly arranged exhibit; decidedly lacking in uniformity of appearance.

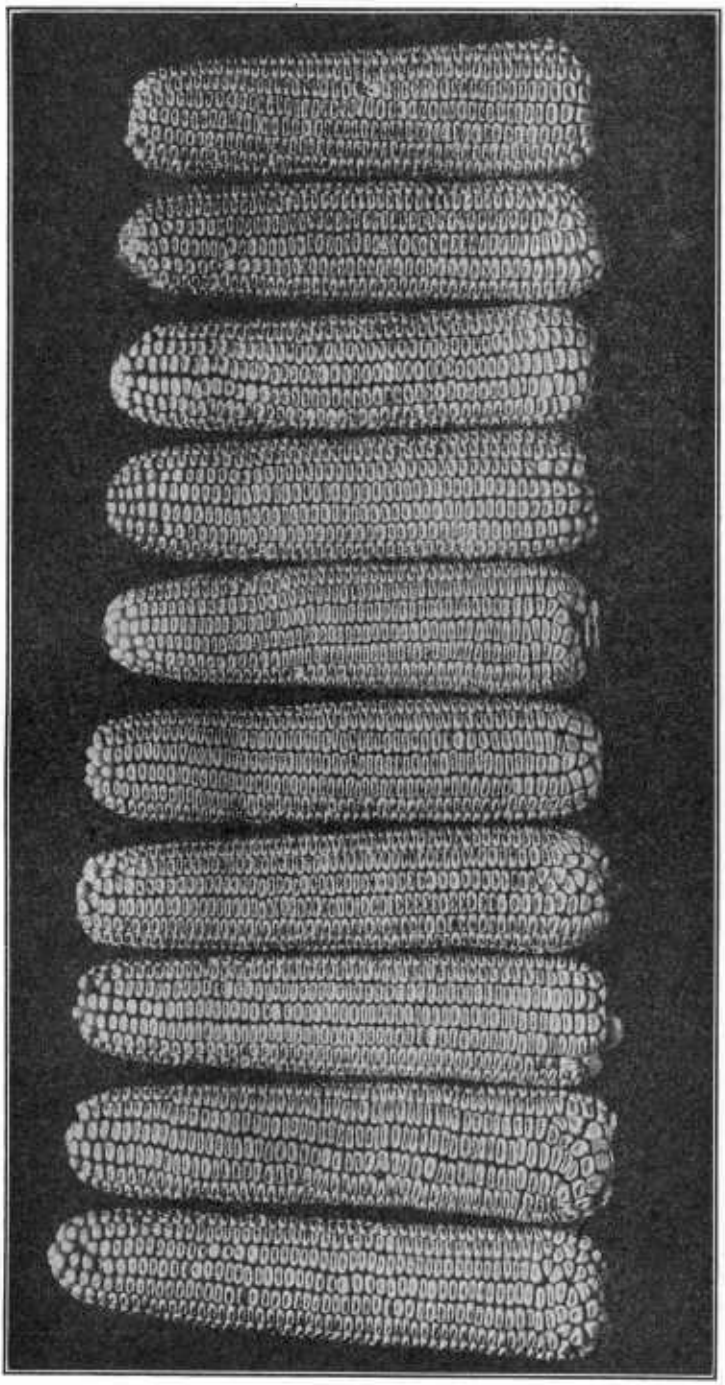

FIG. 12.—The same exhibit properly arranged; ears nicely graduated as to length.

EXERCISE 6.—SIMPLE CORN BREEDING.

Nearly all methods of improving the quality or yield of the corn crop are collectively termed "corn breeding" in agricultural bulletins. Much improvement can be brought about without any "crossing" of different types of corn merely by *selecting* those ears that produce the best types and yields. The best yielding ears can only be determined, however, by planting them in the field and carefully weighing their products. If all the kernels from a good ear are planted beside those from other ears that may be inferior, the "mixing" which results (see p. 10) does not give yields that are a true indication of what the first ear might have produced if planted by itself.

This explanation will make clear the reason for certain precautions to be followed in an experiment which can be carried out by almost any rural-school class in agriculture, working together or individually.

Select ten of the best ears that can be found of a type as nearly uniform as possible in size, color, shape of kernels, and other features, and which show good germinating strength in the test explained on pages 14–20. Then select a good plat of ground as far as possible from any other field of corn, and plant in it one row of 50 or 100 hills from each of the selected ears. The unplanted portion of each ear must be carefully saved for further use. This kind of experiment is known as the "ear-to-row test."

The soil of this plat should be as uniform as possible in quality, slope, and cultivation throughout the season. At husking time the crop should be carefully weighed, as explained in the preceding exercise. One will probably be surprised at the *difference* of yields shown from different ears, even when the utmost care has been taken to treat them all alike. This proves that no one can tell beforehand which of two similar ears of corn will produce the larger crop; there is as much difference between them as between cows of the same breed and color, and no one can tell definitely what the difference is in any case either in cows or corn without taking care to *measure* it.

Some of the corn rows in your experimental plat may prove to be quite inferior, so that you will not wish to save any of their product for seed. Others may have shown so high a yield that their ears will make much better seed corn than you could be *sure* of finding in a large cornfield. These should be carefully saved for next year's field crop; but you can not be sure yet that they are as good seed as you may be able to produce.

Next year plant another test plat with the *remnants of the seed ears* that were left from planting the first plat, throwing away all that produced poor rows the first year. (This means that they must have been permanently numbered to correspond with the rows planted

from them in the first plat.) There may be enough kernels to plant as many hills and rows as in the first plat, but it is considered best not to plant two rows together from the same ear; instead plant at least one row from some other ear between them. After planting all the full rows of the plat whatever kernels are left on the several seed ears can be shelled and mixed together. Use these for planting a border of one or two rows around the entire plat, but do not count these rows in estimating the yield of the plat.

At the end of the second season weigh the crop as before and compare with yields from the same seed in the preceding year and also with the same number of hills in the general cornfield. You may find that the poorest row in the second plat produced better than any one row in the field. It is at least clear that whatever mixing took place in the second-year plat was from seed that was *better* than the average of the field. The study given to these experiments may lead someone in the class to become a grower of the best seed corn in his county or State.

Those who wish to study the breeding of seed corn more fully can send for Farmers' Bulletin 267 (pp. 5–10) and whatever bulletins have been published on this subject by the experiment station in their own State. Bulletin 112 of the Nebraska Experiment Station, at Lincoln, is one of the latest and most complete station bulletins on this subject.

A classified list of publications useful to farmers, teachers, and pupils in the study of corn is given under the following heading:

PUBLICATIONS USEFUL IN CORN STUDY.

A number of books have appeared in recent years that are of much value to schools and teachers that wish to make a careful study of corn. In many cases it is likely that farmers who have boys and girls interested in such study would be glad to meet with them and the teacher to discuss some of these books and bulletins one or two evenings a week in the winter term. Some farmer may be found willing to take the lead in directing such study. To give assistance in this work the books below are suggested as among those that can be used; they can be procured through local book dealers:

CORN BOOKS.

The Book of Corn (New York, 1903, pp. 368, figs. 95).

Manual of Corn Judging, by A. D. Shamel (New York, 1903, pp. 35, pls. 12).

The A B C of Corn Culture, by P. G. Holden (Springfield, Ohio, 1906, pp. 92, figs. 84).

Corn: Growing, Judging, Breeding, Feeding, and Marketing, by M. L. Bowman and B. W. Crossley (Ames, Iowa, 1908, pp. 480, figs. 172, 9 full-page colored plates, illustrating insects injurious to corn).

The Study of Corn, by V. M. Shoesmith (New York, 1910, pp. 94, figs. 25).

To these are added the following classified list of corn bulletins, some of which have been already referred to in this bulletin. Those noted as "Farmers' Bulletins" are furnished free by the United States Department of Agriculture, Washington, D. C., as long as the supply lasts. They may also be obtained from Senators, Representatives, and Delegates in Congress; also from the Superintendent of Documents, Government Printing Office, at 5 cents per copy. Those issued by one's own state experiment station or agricultural college can also be had free of charge by addressing the director or president, and usually at least one copy of those issued by other States can be had in the same way:

BULLETINS ON CORN.

GENERAL.

The Nebraska Corn Book, Department of Public Instruction, Lincoln, Nebr.
Studies of Corn and Its Uses, Illinois Agricultural College Extension Bulletin, Urbana, Ill.
Corn Study, South Dakota Agricultural College Bulletin, Vol. II, No. 2.
The Production of Good Seed Corn, Farmers' Bulletin 229.
Corn Culture in the South, Farmers' Bulletin 81.
Growing Sweet-corn Seed in the South, Farmers' Bulletin 222 (pp. 9–11).
Value of Flint Varieties of Corn, Farmers' Bulletin 225 (pp. 8–9).
Pop Corn, Farmers' Bulletin 202 (pp. 17–20).
Extension of the Corn-growing Area, Farmers' Bulletin 227 (pp. 7–10).

SEED-CORN SELECTION.

Bulletin 116, Agricultural Experiment Station, Kingston, R. I.
Bulletin 122, Agricultural Experiment Station, Lexington, Ky.
Agricultural College Extension Bulletin 1, Vol. II, Columbus, Ohio.
Agricultural and Mechanical College Bulletin 2, Teachers' Series, Stillwater, Okla.
Farmers' Bulletins 193 (pp. 20–26), 225 (pp. 9, 10), 229, 244 (pp. 5–7), 253.

SEED-CORN TESTING.

Special Bulletin 47, Agricultural Experiment Station, East Lansing, Mich.
Agricultural College Extension Bulletin 7, Vol. II, Columbus, Ohio.
Agricultural and Mechanical College Bulletin 2, Teachers' Series, Stillwater, Okla.
Farmers' Bulletins 229 and 253, U. S. Department of Agriculture.

TIME AND METHODS OF PLANTING.

Bulletins 55, 65, Agricultural Experiment Station, Experiment, Ga.
Bulletin 147, Agricultural Experiment Station, Manhattan, Kans.
Bulletin 104, Agricultural Experiment Station, Clemson College, S. C
Bulletin 134, Agricultural Experiment Station, Auburn, Ala.
Planting and Replanting Corn, Farmers' Bulletin 92 (pp. 6, 7).

FERTILIZERS, AND HOW TO APPLY THEM.

Farmers' Bulletins 44, 192, 388 (p. 5).

CORN-HARVESTING METHODS AND MACHINERY.

Farmers' Bulletins 303, 313.

FEEDING CORN TO LIVE STOCK.

Bulletin 102, Agricultural Experiment Station, Urbana, Ill.
Farmers' Bulletins 22 and 32.
Corn *vs.* Wheat, Farmers' Bulletin 56 (p. 4).
The Value of Corn as a Forage Crop, Farmers' Bulletin 65 (pp. 6, 7).
Corn Stover as a Feeding Stuff, Farmers' Bulletin 84 (pp. 12–14).
The Feeding Value of the Corn Plant at Different Stages of Growth, Farmers' Bulletin 97 (pp. 9–12).
Feeding Moldy Corn, Farmers' Bulletin 122 (pp. 26, 27).

USES OF CORN FOR HUMAN FOOD.

Nebraska Corn Book, Department of Public Instruction, Lincoln, Nebr.
Farmers' Bulletins 249, 281 (pp. 18–22), 298.

CORN DISEASES AND PESTS.

Corn Smut, Farmers' Bulletin 69 (pp. 18–20).
Cultural Methods of Controlling Corn Billbugs and the Corn Root-louse, Farmers' Bulletin 259 (pp. 20, 21).
The Larger Cornstalk Borer, Bureau of Entomology Circular 16, U. S. Department of Agriculture.
The Corn Root-worms, Bureau of Entomology Circular 59, U. S. Department of Agriculture.
The Slender Seed-corn Ground-beetle (*Clivina impressifrons* Lec.), Bureau of Entomology Circular 78, U. S. Department of Agriculture.

CORN CLUB BULLETINS.

Ohio University Bulletin 10, Series 8, Columbus, Ohio.
Ohio University Bulletin 22, Series 7, Columbus, Ohio.
The Winnebagoes, 1903, County Superintendent O. J. Kern, Rockford, Ill.
Nebraska Boys' and Girls' Associations, University Bulletin, Lincoln, Nebr.
The Nebraska Corn Book, Department of Public Instruction, Lincoln, Nebr.
Boys' Agricultural Club Bulletin, County Superintendent Jessie Field, Clarinda, Iowa.
Bulletin 98, University of Georgia, Athens, Ga.
Mississippi School Boys' Experiment Club, Agricultural College, Miss.
Bulletin 1, Vol. 7, Agricultural and Mechanical College, Stillwater, Okla.
The Grout Farm Encampment, University of Illinois, Urbana, Ill.
Boys' and Girls' Agricultural Clubs, Farmers' Bulletin 385.

NOTE.—Circular 94 of the Office of Experiment Stations contains a list of the free publications of the U. S. Department of Agriculture, classified for the convenient use of teachers in the public schools.

FARMERS' BULLETINS.

Bulletins in this list will be sent free, so long as the supply lasts, to any resident of the United States, on application to his **Senator, Representative, or Delegate in Congress,** or to the Secretary of Agriculture, Washington, D. C. Because of the limited supply, applicants are urged to select only a few numbers, choosing those which are of special interest to them. Residents of foreign countries should apply to the Superintendent of Documents, Government Printing Office, Washington, D. C., who has these bulletins for sale. Price 5 cents each to Canada, Cuba, and Mexico; 6 cents to other foreign countries. The bulletins entitled "Experiment Station Work" give briefly the results of experiments performed by the State experiment stations.

22. The Feeding of Farm Animals.
27. Flax for Seed and Fiber.
28. Weeds: And How to Kill Them.
30. Grape Diseases on the Pacific Coast.
32. Silos and Silage.
34. Meats: Composition and Cooking.
35. Potato Culture.
36. Cotton Seed and Its Products.
44. Commercial Fertilizers.
48. The Manuring of Cotton.
49. Sheep Feeding.
51. Standard Varieties of Chickens.
52. The Sugar Beet.
54. Some Common Birds.
55. The Dairy Herd.
56. Experiment Station Work—I.
60. Methods of Curing Tobacco.
61. Asparagus Culture.
62. Marketing Farm Produce.
63. Care of Milk on the Farm.
64. Ducks and Geese.
65. Experiment Station Work—II.
69. Experiment Station Work—III.
73. Experiment Station Work—IV.
77. The Liming of Soils.
78. Experiment Station Work—V.
79. Experiment Station Work—VI.
81. Corn Culture in the South.
82. The Culture of Tobacco.
83. Tobacco Soils.
84. Experiment Station Work—VII.
85. Fish as Food.
86. Thirty Poisonous Plants.
87. Experiment Station Work—VIII.
88. Alkali Lands.
91. Potato Diseases and Treatment.
92. Experiment Station Work—IX.
93. Sugar as Food.
96. Raising Sheep for Mutton.
97. Experiment Station Work—X.
99. Insect Enemies of Shade Trees.
101. Millets.
103. Experiment Station Work—XI.
104. Notes on Frost.
105. Experiment Station Work—XII.
106. Breeds of Dairy Cattle.
110. Rice Culture in the United States.
113. The Apple and How to Grow It.
114. Experiment Station Work—XIV.
118. Grape Growing in the South.
119. Experiment Station Work—XV.
120. Insects Affecting Tobacco.
121. Beans, Peas, and Other Legumes as Food.
122. Experiment Station Work—XVI.
126. Practical Suggestions for Farm Buildings.
127. Important Insecticides.
128. Eggs and Their Uses as Food.
131. Household Tests for Detection of Oleomargarine and Renovated Butter.
133. Experiment Station Work—XVIII.
134. Tree Planting on Rural School Grounds.
135. Sorghum Sirup Manufacture.
137. The Angora Goat.
138. Irrigation in Field and Garden.
139. Emmer: A Grain for the Semiarid Regions.
140. Pineapple Growing.
142. Nutrition and Nutritive Value of Food.
144. Experiment Station Work—XIX.
145. Carbon Bisulphid as an Insecticide.
149. Experiment Station Work—XX.
150. Clearing New Land.
152. Scabies of Cattle.
154. Home Fruit Garden: Preparation and Care.
155. How Insects Affect Health in Rural Districts.
156. The Home Vineyard.
157. The Propagation of Plants.
158. How to Build Small Irrigation Ditches.
162. Experiment Station Work—XXI.
164. Rape as a Forage Crop.
166. Cheese Making on the Farm.
167. Cassava.
169. Experiment Station Work—XXII.
170. Principles of Horse Feeding.
172. Scale Insects and Mites on Citrus Trees.
173. Primer of Forestry. Part I: The Forest.
174. Broom Corn.
175. Home Manufacture and Use of Unfermented Grape Juice.
176. Cranberry Culture.
177. Squab Raising.
178. Insects Injurious in Cranberry Culture.
179. Horseshoeing.
181. Pruning.
182. Poultry as Food.
183. Meat on the Farm: Butchering, Curing, etc.
185. Beautifying the Home Grounds.
186. Experiment Station Work—XXIII.
187. Drainage of Farm Lands.
188. Weeds Used in Medicine.
190. Experiment Station Work—XXIV.
192. Barnyard Manure.
193. Experiment Station Work—XXV.
194. Alfalfa Seed.
195. Annual Flowering Plants.
196. Usefulness of the American Toad.
197. Importation of Game Birds and Eggs for Propagation.
198. Strawberries.
200. Turkeys.
201. Cream Separator on Western Farms.
202. Experiment Station Work—XXVI.
203. Canned Fruits, Preserves, and Jellies.
204. The Cultivation of Mushrooms.
205. Pig Management.
206. Milk Fever and Its Treatment.
209. Controlling the Boll Weevil in Cotton Seed and at Ginneries.
210. Experiment Station Work—XXVII.
213. Raspberries.
218. The School Garden.
219. Lessons from Grain Rust Epidemic of 1904.
220. Tomatoes.
221. Fungous Diseases of the Cranberry.
222. Experiment Station Work—XXVIII.
223. Miscellaneous Cotton Insects in Texas.
224. Canadian Field Peas.
225. Experiment Station Work—XXIX.
227. Experiment Station Work—XXX.
228. Forest Planting and Farm Management.
229. The Production of Good Seed Corn.
231. Spraying for Cucumber and Melon Diseases.
232. Okra: Its Culture and Uses.
233. Experiment Station Work—XXXI.
234. The Guinea Fowl.
235. Preparation of Cement Concrete.
236. Incubation and Incubators.
237. Experiment Station Work—XXXII.
238. Citrus Fruit Growing in the Gulf States.
239. The Corrosion of Fence Wire.
241. Butter Making on the Farm.
242. An Example of Model Farming.
243. Fungicides and Their Use in Preventing Diseases of Fruits.
244. Experiment Station Work—XXXIII.
245. Renovation of Worn-out Soils.
246. Saccharine Sorghums for Forage.
248. The Lawn.
249. Cereal Breakfast Foods.
250. The Prevention of Stinking Smut of Wheat and Loose Smut of Oats.

251. Experiment Station Work—XXXIV.
252. Maple Sugar and Sirup.
253. The Germination of Seed Corn.
254. Cucumbers.
255. The Home Vegetable Garden.
256. Preparation of Vegetables for the Table.
257. Soil Fertility.
258. Texas or Tick Fever and Its Prevention.
259. Experiment Station Work—XXXV.
260. Seed of Red Clover and Its Impurities.
262. Experiment Station Work—XXXVI.
263. Information for Beginners in Irrigation.
264. The Brown-tail Moth and How to Control It.
266. Management of Soils to Conserve Moisture.
267. Experiment Station Work—XXXVII.
269. Industrial Alcohol: Uses and Statistics.
270. Modern Conveniences for the Farm Home.
271. Forage Crop Practices in Western Oregon and Western Washington.
272. A Successful Hog and Seed-corn Farm.
273. Experiment Station Work—XXXVIII.
274. Flax Culture.
275. The Gipsy Moth and How to Control It.
276. Experiment Station Work—XXXIX.
277. Alcohol and Gasoline in Farm Engines.
278. Leguminous Crops for Green Manuring.
279. A Method of Eradicating Johnson Grass.
280. A Profitable Tenant Dairy Farm.
281. Experiment Station Work—XL.
282. Celery.
283. Spraying for Apple Diseases and the Codling Moth in the Ozarks.
284. Insect and Fungous Enemies of the Grape East of the Rocky Mountains.
286. Comparative Value of Whole Cotton Seed and Cotton-seed Meal in Fertilizing Cotton.
287. Poultry Management.
288. Nonsaccharine Sorghums.
289. Beans.
290. The Cotton Bollworm.
291. Evaporation of Apples.
292. Cost of Filling Silos.
293. Use of Fruit as Food.
294. Farm Practice in Columbia Basin Uplands.
295. Potatoes and Other Root Crops as Food.
296. Experiment Station Work—XLI.
298. Food Value of Corn and Corn Products.
299. Diversified Farming Under the Plantation System.
301. Home-grown Tea.
302. Sea Island Cotton: Its Culture, Improvement, and Diseases.
303. Corn Harvesting Machinery.
304. Growing and Curing Hops.
305. Experiment Station Work—XLII.
306. Dodder in Relation to Farm Seeds.
307. Roselle: Its Culture and Uses.
309. Experiment Station Work—XLIII.
310. A Successful Alabama Diversification Farm.
311. Sand-clay and Burnt-clay Roads.
312. A Successful Southern Hay Farm.
313. Harvesting and Storing Corn.
314. A Method of Breeding Early Cotton to Escape Boll-weevil Damage.
316. Experiment Station Work—XLIV.
317. Experiment Station Work—XLV.
318. Cowpeas.
319. Demonstration Work in Cooperation with Southern Farmers.
320. Experiment Station Work—XLVI.
321. The Use of the Split-log Drag on Earth Roads.
322. Milo as a Dry-land Grain Crop.
323. Clover Farming on the Sandy Jack-pine Lands of the North.
324. Sweet Potatoes.
325. Small Farms in the Corn Belt.
326. Building Up a Run-down Cotton Plantation.
328. Silver Fox Farming.
329. Experiment Station Work—XLVII.
330. Deer Farming in the United States.
331. Forage Crops for Hogs in Kansas and Oklahoma.
332. Nuts and Their Uses as Food.
333. Cotton Wilt.
334. Experiment Station Work—XLVIII.
335. Harmful and Beneficial Mammals of the Arid Interior.
337. Cropping Systems for New England Dairy Farms.
338. Macadam Roads.
339. Alfalfa.
341. The Basket Willow.
342. Experiment Station Work—XLIX.
343. The Cultivation of Tobacco in Kentucky and Tennessee.
344. The Boll Weevil Problem, with Special Reference to Means of Reducing Damage.
345. Some Common Disinfectants.
346. The Computation of Rations for Farm Animals by the Use of Energy Values.
347. The Repair of Farm Equipment.
348. Bacteria in Milk.
349. The Dairy Industry in the South.
350. The Dehorning of Cattle.
351. The Tuberculin Test of Cattle for Tuberculosis.
352. The Nevada Mouse Plague of 1907–8.
353. Experiment Station Work—L.
354. Onion Culture.
355. A Successful Poultry and Dairy Farm.
356. Peanuts.
357. Methods of Poultry Management at the Maine Agricultural Experiment Station.
358. A Primer of Forestry. Part II: Practical Forestry.
359. Canning Vegetables in the Home.
360. Experiment Station Work—LI.
361. Meadow Fescue: Its Culture and Uses.
362. Conditions Affecting the Value of Market Hay.
363. The Use of Milk as Food.
364. A Profitable Cotton Farm.
365. Farm Management in Northern Potato-growing Sections.
366. Experiment Station Work—LII.
367. Lightning and Lightning Conductors.
368. The Eradication of Bindweed, or Wild Morning-glory.
369. How to Destroy Rats.
370. Replanning a Farm for Profit.
371. Drainage of Irrigated Lands.
372. Soy Beans.
373. Irrigation of Alfalfa.
374. Experiment Station Work—LIII.
375. Care of Food in the Home.
376. Game Laws for 1909.
377. Harmfulness of Headache Mixtures.
378. Methods of Exterminating Texas-fever Tick.
379. Hog Cholera.
380. The Loco-weed Disease.
381. Experiment Station Work—LIV.
382. The Adulteration of Forage-plant Seeds.
383. How to Destroy English Sparrows.
384. Experiment Station Work—LV.
385. Boys' and Girls' Agricultural Clubs.
386. Potato Culture on Irrigated Farms of the West.
387. The Preservative Treatment of Farm Timbers.
388. Experiment Station Work—LVI.
389. Bread and Bread Making.
390. Pheasant Raising in the United States.
391. Economical Use of Meat in the Home.
392. Irrigation of Sugar Beets.
393. Habit-forming Agents.
394. Windmills in Irrigation in Semiarid West.
395. Sixty-day and Kherson Oats.
396. The Muskrat.
397. Bees.
398. Farm Practice in the Use of Commercial Fertilizers in the South Atlantic States.
399. Irrigation of Grain.
400. A More Profitable Corn-planting Method.
401. Protection of Orchards in Northwest from Spring Frosts by Fires and Smudges.
402. Canada Bluegrass: Its Culture and Uses.
403. The Construction of Concrete Fence Posts.
404. Irrigation of Orchards.
405. Experiment Station Work—LVII.
406. Soil Conservation.
407. The Potato as a Truck Crop.
408. School Exercises in Plant Production.

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